# PROPERTIES OF MATTER

Matter is the “stuff” from which all objects and substances in the universe are made. Matter takes up space, meaning it has volume. Matter contains a certain amount of material, therefore it has mass. Because all matter has mass and volume, all matter can be detected, though some more easily than others. All matter has both physical and chemical properties. Matter can be classified according to these physical and chemical properties. The 6th grade student will continue to build on their previous understanding of the properties of matter by classifying substances by their physical and chemical properties. Students in elementary school explored physical properties of matter, but they did not address chemical properties. Activities at the 6th grade level should focus on chemical as well as physical properties of matter.

**Physical Properties**

Physical properties are those that can be observed without changing the make-up, or identity, of the matter. The chart below lists some common physical properties of matter

| Physical Properties | What It Means | What Students Should Understand | Graphic |
| --- | --- | --- | --- |
| Appearance | Color, size, shape, texture, luster (how a substance reflects light) | Physical properties can be observed using the senses to identify and describe matter. | measure |
| Buoyancy | Tendency to float or rise in a fluid (liquid or gas) | Buoyancy applies to both liquids and gases and is determined in part by density and fluid displacement. | bd08273_ |
| **Boiling Point** | Temperature at which a substance changes from a liquid to a gas | Most substances have a unique boiling point that can be used with other properties to identify substances. | thermostat |
| **Conductivity** | Ability of a substance to conduct heat, sound, or electricity | Heat, sound, and electricity travel better through some substances (conductors) than through others (insulators). | lightbulb |
| **Density** | Amount of matter in a given volume; expressed as D = m/v | When two substances have the same volume, the one with greater mass has greater density. For example, a cup of feathers and a cup of marbles have the same volume, but because the cup of marbles has greater mass it has a greater density. Students will calculate density. | bs01947_ |
| **Ductility** | Ability of a substance to be pulled into a thin strand, such as a wire | This property is often used to determine if a substance can be used to make wire. | j0316428 |
| **Hardness** | Ability of a substance to resist being scratched | A harder substance will scratch a softer substance. | rock & pick |
| **Magnetism** | Ability to attract iron | Without touching them, a magnet pulls on all things made of iron and either pushes or pulls on other magnets. | hh02313_ |
| **Malleability** | Ability of a substance to be pressed or pounded into a thin sheet | This property is used to determine if a substance can be rolled into thin sheets. (example: aluminum foil). | j0281756 |
| Mass | Measure of the amount of matter in a solid, liquid, or gas (measured in grams) | All solids, liquids, and gases have mass because they are all made of matter rather than energy. At this level the mass of an object should be measured using a triple beam balance. Students should understand the difference between mass and weight. | j0417518 |
| **Melting Point** | Temperature at which a substance changes from a solid to a liquid | Most substances have a unique melting point that can be used with other properties to identify substances. The temperature at which a substance melts and freezes is the same (melting point = freezing point). | thermostat |
| **Odor** | Ability of a substance to give off a certain smell | This is not always the best physical property to use to describe substances because odor is difficult to distinguish and it can be considered subjective. However, some substances have distinct odors, such as sulfur which smells like rotten eggs. | an01729_ |
| **Solubility** | Ability of a substance to dissolve in another substance | A solution is a mixture that appears to be a single substance. It is composed of particles of two or more substances that are distributed evenly among each other. | beaker_mix |
| **State of Matter** | Matter exists as a solid, liquid, or gas | A solid has a definite shape and volume. A liquid has a definite volume and takes the shape of the container it is in. A gas has no definite shape or volume but changes to match the shape and volume of the container it is in. Students should also understand that a liquid or a gas can be referred to as a fluid. Changes in the state of matter are caused by the addition or reduction of energy. | ****  ****  **** |
| Temperature | Amount of energy in matter (measured in degrees Celsius or Fahrenheit) | A change in temperature is a measure of the loss or gain of energy in matter. Scientists generally measure temperature in degrees Celsius. | j0413624 |
| **Volume** | Amount of space an object or substance takes up, measured in cm3 or ml. | Graduated cylinders allow precision in measuring volume. Students should practice reading a meniscus. The volume of an irregular solid can be found by displacement of water. | in00461_ |